

Magnetically Trained Thermal Oscillation in Twin, Intermittently Interacting Fluid Streams for Enhanced Heat Exchange

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In applications ranging from metallurgy to computing, there continues to be demand for leading-edge heat transfer mechanisms which form the interface between a cooling apparatus and an object to be cooled.

Even with the advent of novel cooling mechanisms including thermo-acousto-electric converters which allow for even minute quantities of heat to be translated back into acoustic energy and subsequently into electricity in support of energy-generation and cooling effects, efficient interfacial materials/mechanisms are needed to support the most demanding cooling applications.

The advent of extremely thin metamaterials capable of blocking magnetism opens the door to the creative use of these materials in order to allow for what might be termed *cross-entropic heat exchange* supported by twin solid state magnets surrounding the overall area being cooled.

The metamaterials would allow for twin fluid channels, one running fluid directly over the object to be cooled (the "hot" channel or "Channel A") and one running fluid directly over the cooling plate ("Channel B.") to experience unique entropic conditions with regard to the directionality of thermal oscillations of the nuclei of the fluid molecules in each of the respective channels.

Ordinarily, this oscillation is haphazard, but the degree of oscillation dictates the temperature of an atom, in any case. In experiments with LASER cooling, the nucleus is treated like a pendulum which, if pushed in the countervailing direction during an upswing, effectively cools the nucleus.

In this case, our object is not to control the nuclei's oscillations so as to reliably catch nuclei on the upswing and to push in the opposing direction. Rather, it is to ensure a perpendicular relationship between the oscillations of nuclei in Channel A and Channel B which ensures that when they reach "intersections" of the two, zig-zagging flow channels, that the hotter of the molecules are able to move into closer proximity with the cold molecules. The mutual repulsion of the negatively charged electrons of the respective molecule types is an unseen impediment to heat transfer. The forces which allow for positively charged particles, sc. the protons in the nucleus, to influence one-another in the context of heat transfer, are separate forces which act over different distances and with different strengths, although physicists consider both to fall within the category of "Coulomb Forces" or "electroweak forces." However, as the mutual repulsion of negative electrons and positive protons are not of the same quality and magnitude as one-another, it can be useful to inhibit the mutual repulsion of the negative particles in these systems when one endeavors to enhance the efficiency of heat transfer.

When there is a perpendicular relationship between the oscillations of fluids in Channel A and Channel B during the phase of cross-entropic interaction, Coulomb Repulsions of the electrons of the systems are mitigated and nuclei from the “hot” channel; Channel A; are able to move into closer proximity with the fluids from the cold channel. In this case, the mitigation of the repulsion of negative charges actually enhances the interaction of the positive charges, meaning that heat transfer is enhanced.

In these intersections, the magnetism-blocking metamaterials are used to block both the magnetic fields of the “A” and the “B” solid-state magnets, allowing for heat transfer to occur unabated.

After passing through these cross-entropic zones or “intersections,” the fluids once again pass into zones in which their thermal oscillations are constrained magnetically so as to oscillate only in one particular direction. In a short span of time, these fluids might pass through thousands of these intersections and it could be predicted that, although the surface area of the interaction would be mitigated by this approach, the heat transfer would be so much more efficient that it would provide a measurable cooling benefit.